University of Saskatchewan

Multi-faceted approaches to weed management in pulse crops

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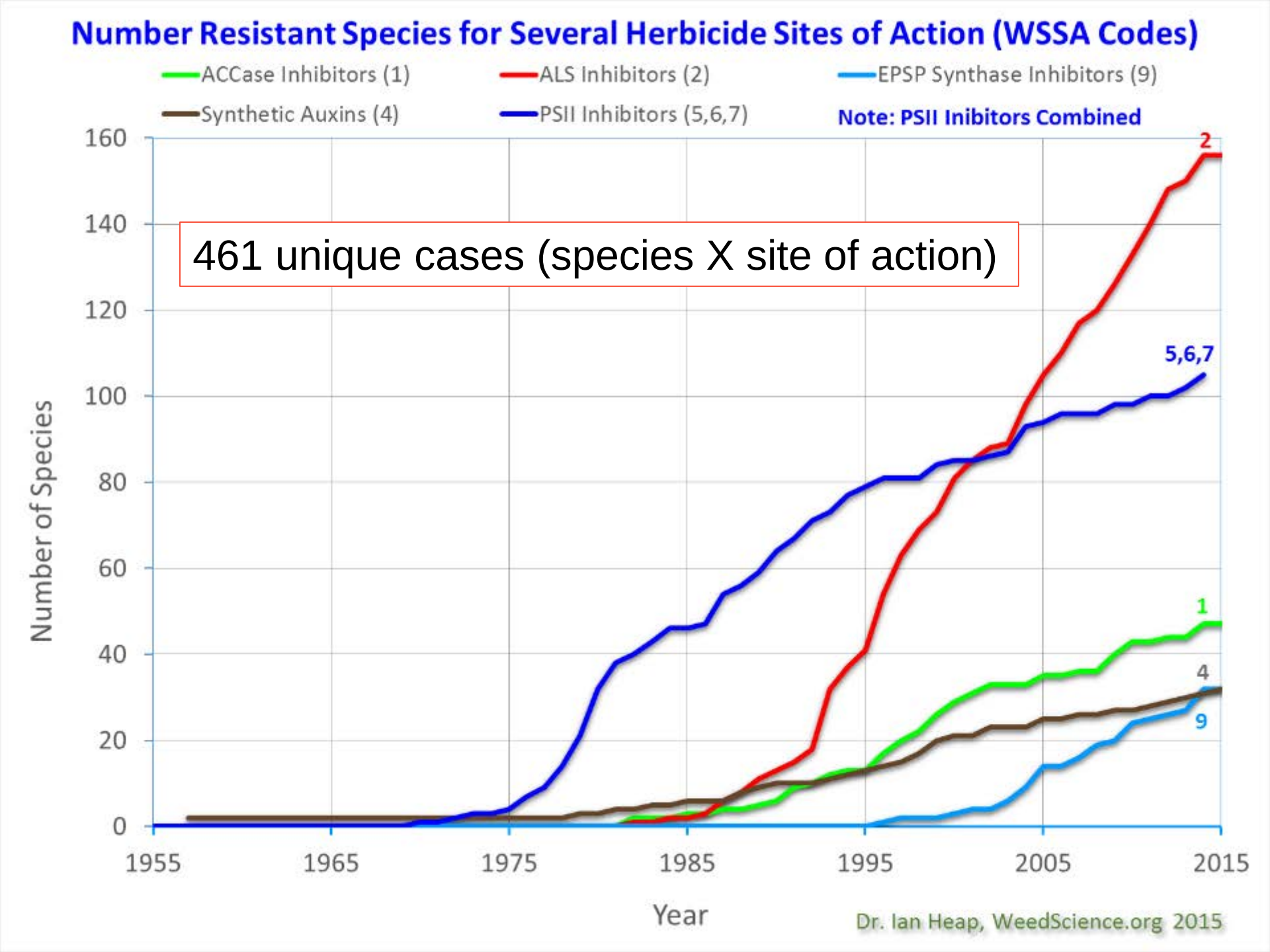

Number Resistant Species for Several Herbicide Sites of Action (WSSA Codes)
ACCase Inhibitors (1)
ALS Inhibitors (2)
EPSP Synthase Inhibitors (9)
Synthetic Auxins (4)
PSII Inhibitors (5,6,7)
Note: PSII Inibitors Combined
461 unique cases (species X site of action)
2
5,6,7
1
4
9
Number of Species
Year
0
20
40
60
80
100
120
140
160
1955
1965
1975
1985
1995
2005
2015
Dr. Ian Heap, WeedScience.org 2015

NEWS

Russian thistle, Flickr.com

Glyphosate-resistant Russian thistle found in Montana

By **Montana State University** on Mar 4, 2016 at 3:46 p.m.

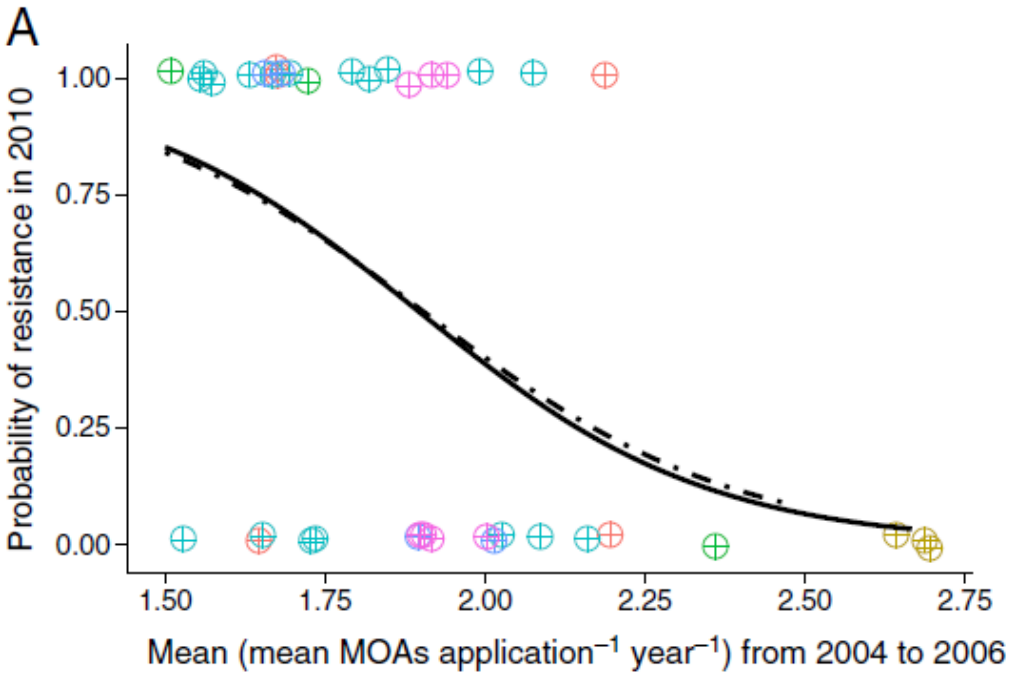
Gp 2 + 4 HR kochia in western Canada

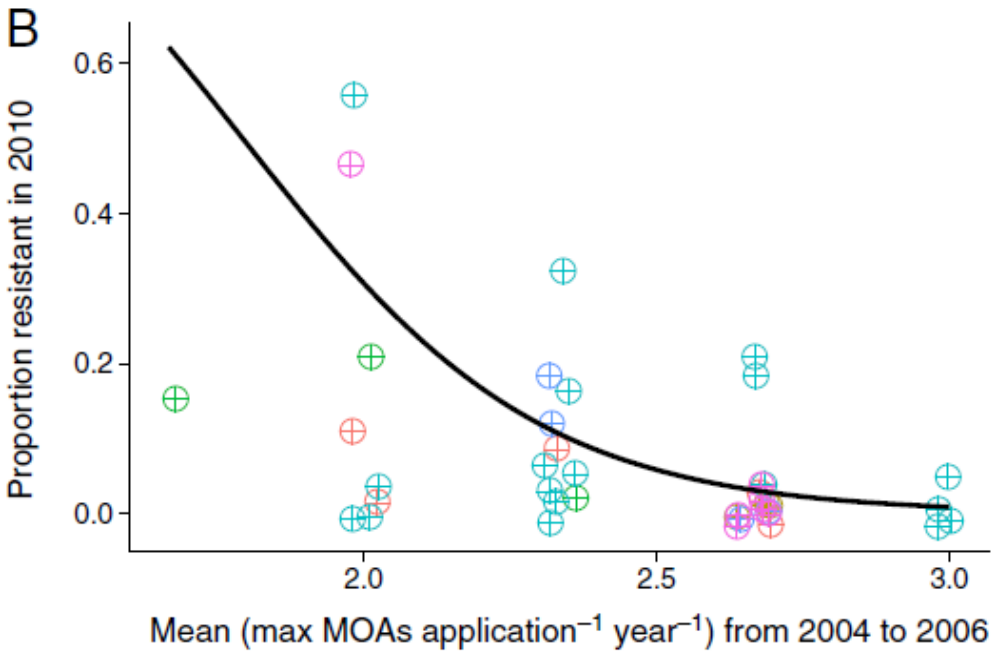
W. Canada pulse crop production threatened

Gp 2-resistant cleavers in peas

Gp 2-resistant kochia and wild mustard in lentils

Year





Effect of Number of MOA's used per year on probability of Glyphosate Resistant Waterhemp Illinois and Proportion of Glyphosate Resistant Seed From: Evans et al. Pest Mgt. Sci. 2015

Weed Control Research in Pulses

- Diversity – Weed / Agronomy Program U of S
  - Chemical
    - Multiple modes of action
    - Groups 13, 14, 15
    - Herbicide layering
  - Cultural
    - Seeding Rates, competitive cultivars
  - Mechanical
    - Rotary hoeing, inter-row cultivation, weed wiping, crop topping, clipping, Harrington seed destructor

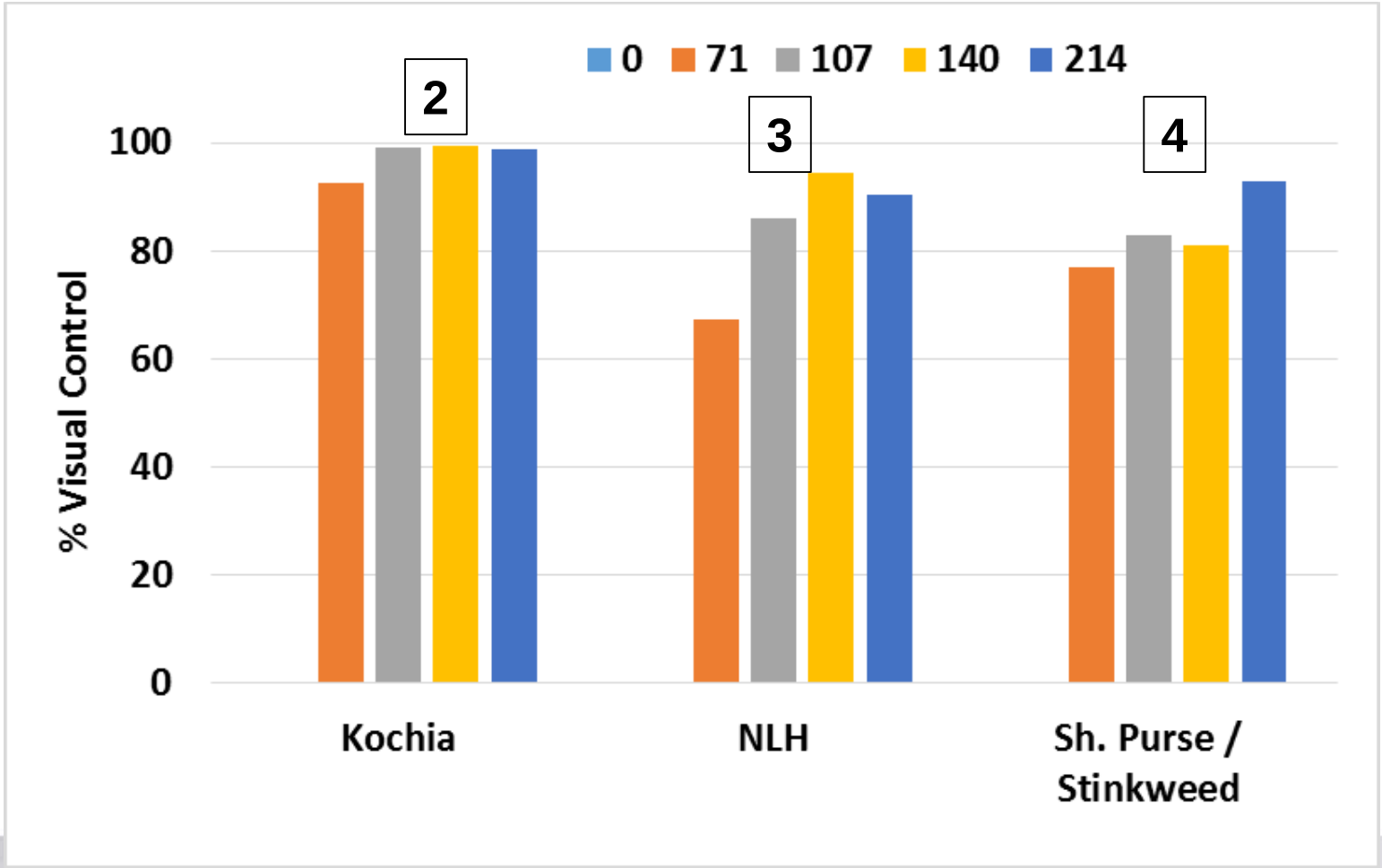
Lentils – Herbicide Research Underway

- Fall applied Valtera (flumioxazin)
- Focus (pyroxasulfone)
- Post-emergence fluthiacet-methyl (Cadet) as a tank-mix with Solo or Sencor

Fall applied Valtera

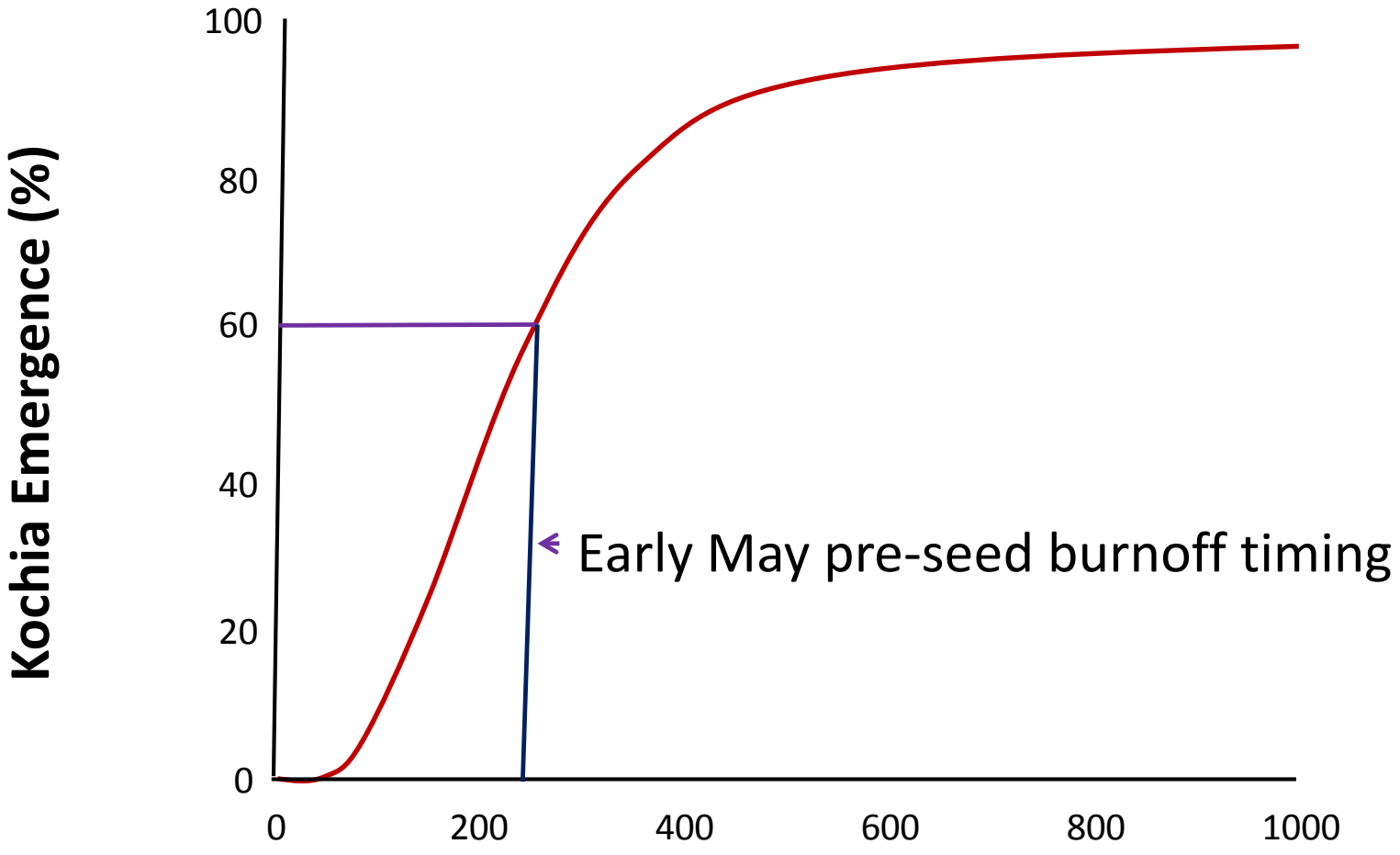
- Valtera is a soil applied Group 14 herbicide
  - Shorter residual than Authority
- Have investigated both fall and spring application prior to lentil
  - Risk of injury with spring application in lentil at rates tested.

Fall applied Valtera – Weed Control Saskatoon and Scott, 2014-15



Numbers above bars indicate # of site-years

Emergence Timing for Kochia



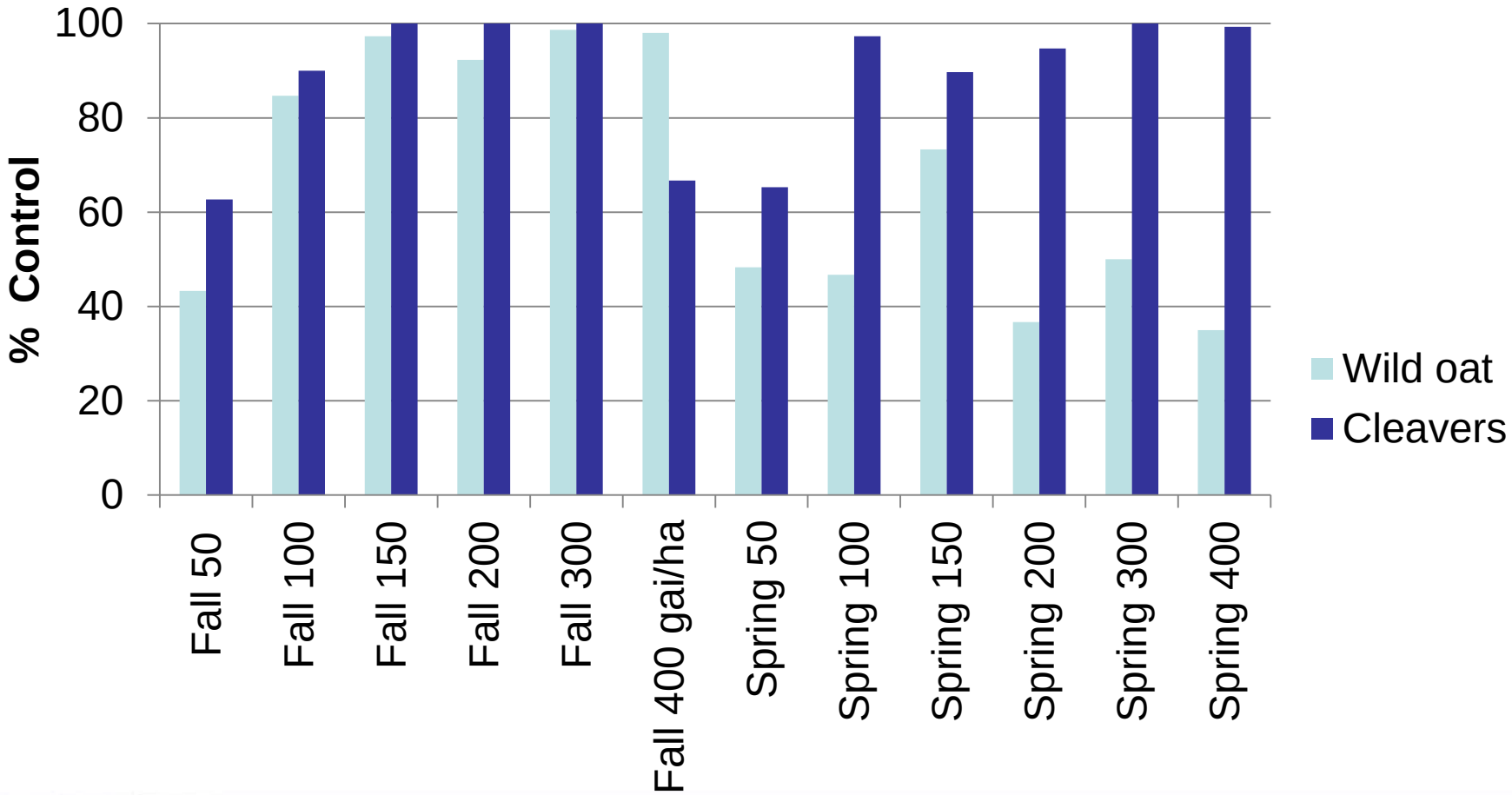
Focus herbicide

- Registered in corn, soybean and now wheat (spring & winter, not durum)
- Combination of carfentrazone (AIM – Group 14), and pyroxasulfone (Group 15).
- Strength - Highly effective in controlling Downy and Japanese brome in winter wheat!

Pyroxasulfone

- Peas and lentils have exhibited good tolerance, pea tolerance > lentil tolerance.
- Chickpea tolerance is very good as well.
- Pyroxasulfone is soil active, works on emerging weeds.
- Requires moisture to control weeds.
- Dry spring reduces efficacy: can result in total failure.

Fall vs Spring Pyroxasulfone (Focus) Scott 2014



Scott Data

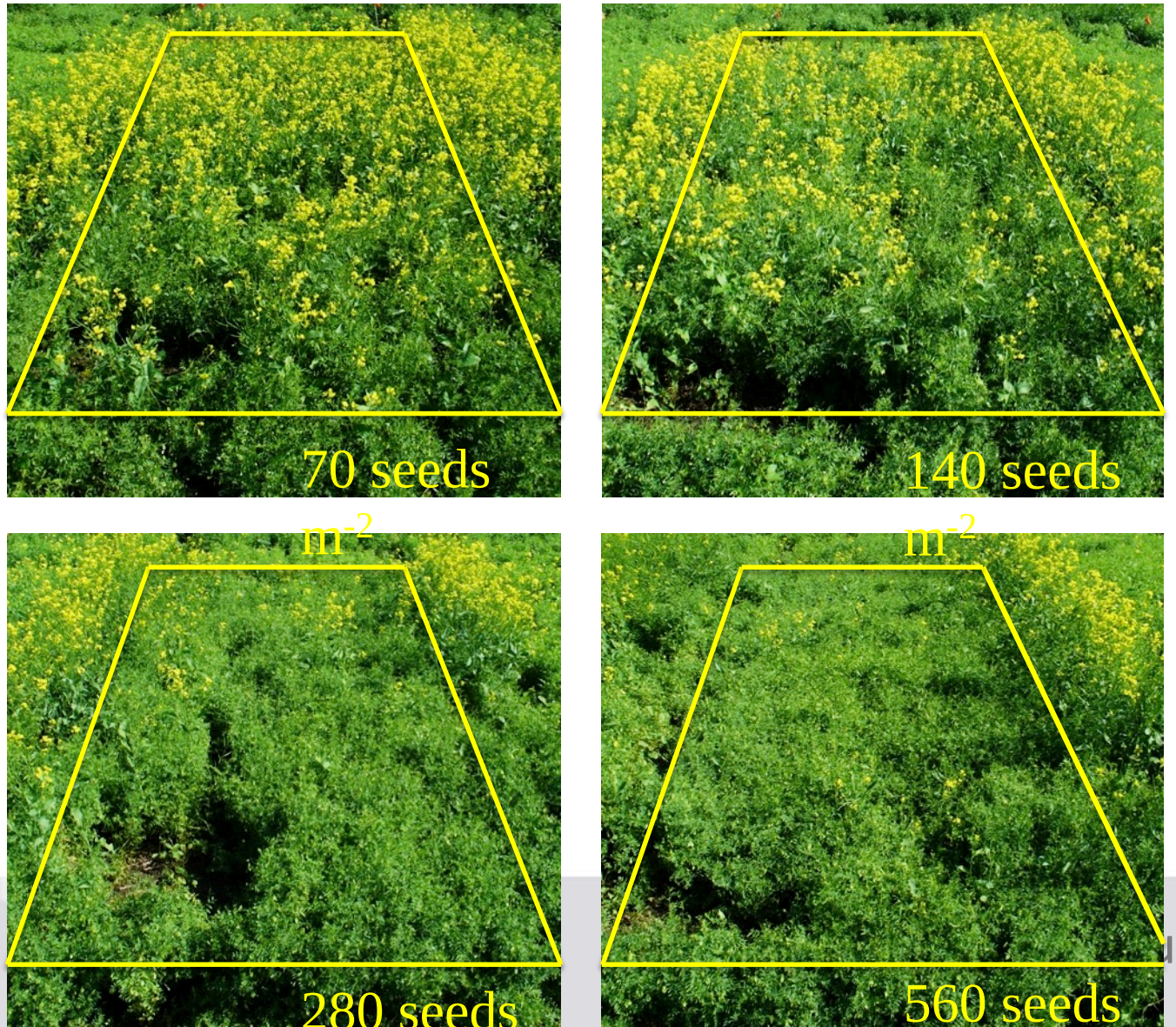
Focus herbicide

- What should your expectations be?
  - Wild oats – about 70% control; however, can range from 40 to >90% control;
  - Wild mustard – around 50% control (I have limited data on this);
  - Kochia – any level of control is a bonus (range 0->90%).
  - Has been very effective on cleavers in soils with 3 to 5% organic matter.

Fluthiacet-Methyl

- Group 14 Post-emergence
- Looking at a tank-mix with Solo or Sencor
- Transient injury – will farmers accept?

Improved Efficacy – 3.75g ai ha^{-1}



Chickpea Research

- Imi-tolerant chickpea – both desi and kabuli
- CDC Alma (kabuli) and CDC Cory (desi)
- Minor Use submission for Solo to PMRA
- All new varieties will be imi-tolerant

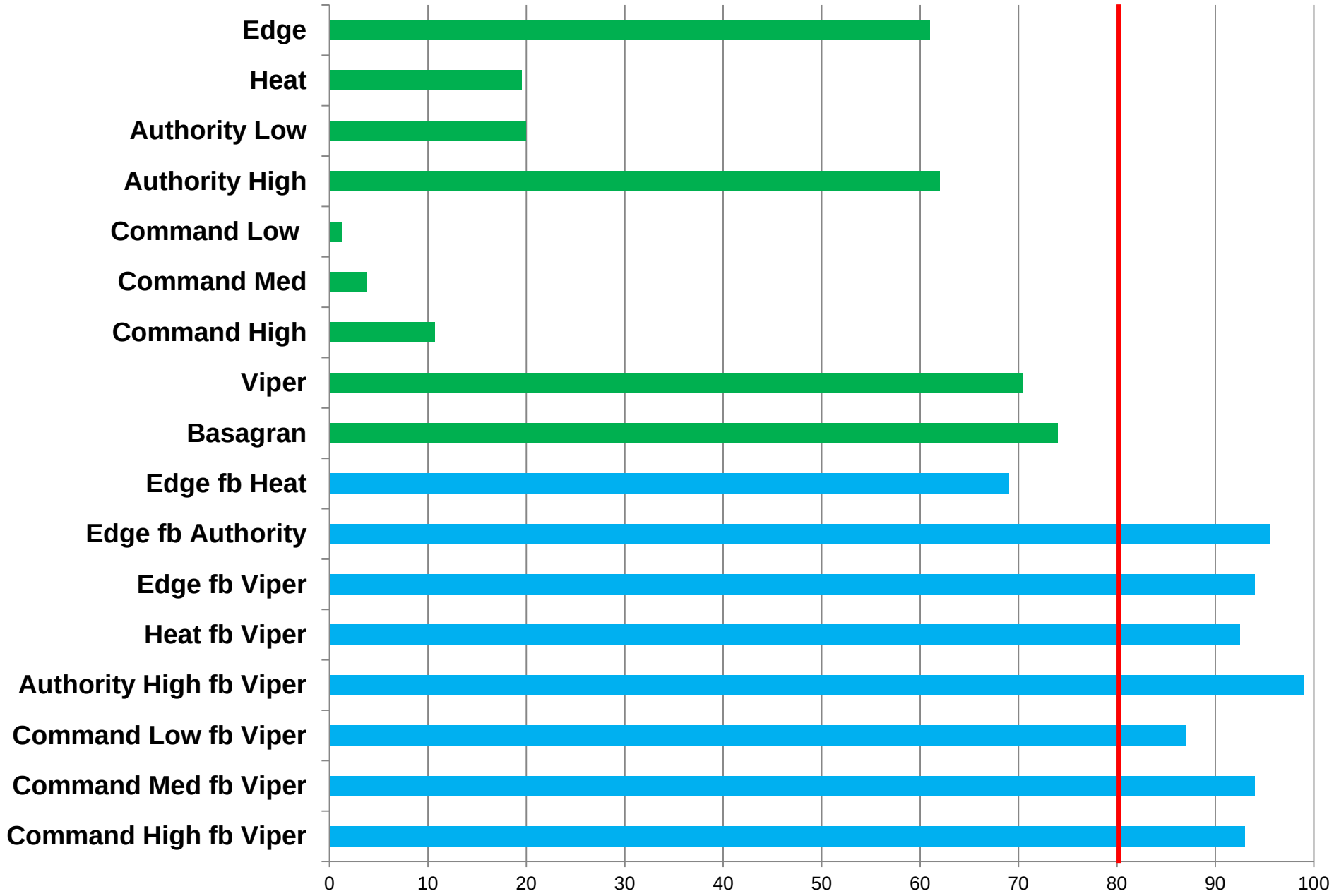
Field Pea - Herbicide Layering

- Using both pre- and post-emergent herbicides of different modes of action to reduce risk of weed resistance and improve overall weed control.
- Have focused on controlling Group 2 resistant cleavers on soils with organic matter > 5%

Herbicide Layering in Pulses

- Pre- is a short or medium-term residual product
  - Concept is to reduce weed population for in-crop application
  - Resistance is a numbers game, reduce the numbers, reduce selection pressure.
- Ideal is to use different herbicide groups, 3 to 4 MOA in the crop

Group 2 Resistant Cleavers Control
Rosthern 2014



Clomazone on Cleavers

Fababean – Data generated for potential Minor Uses

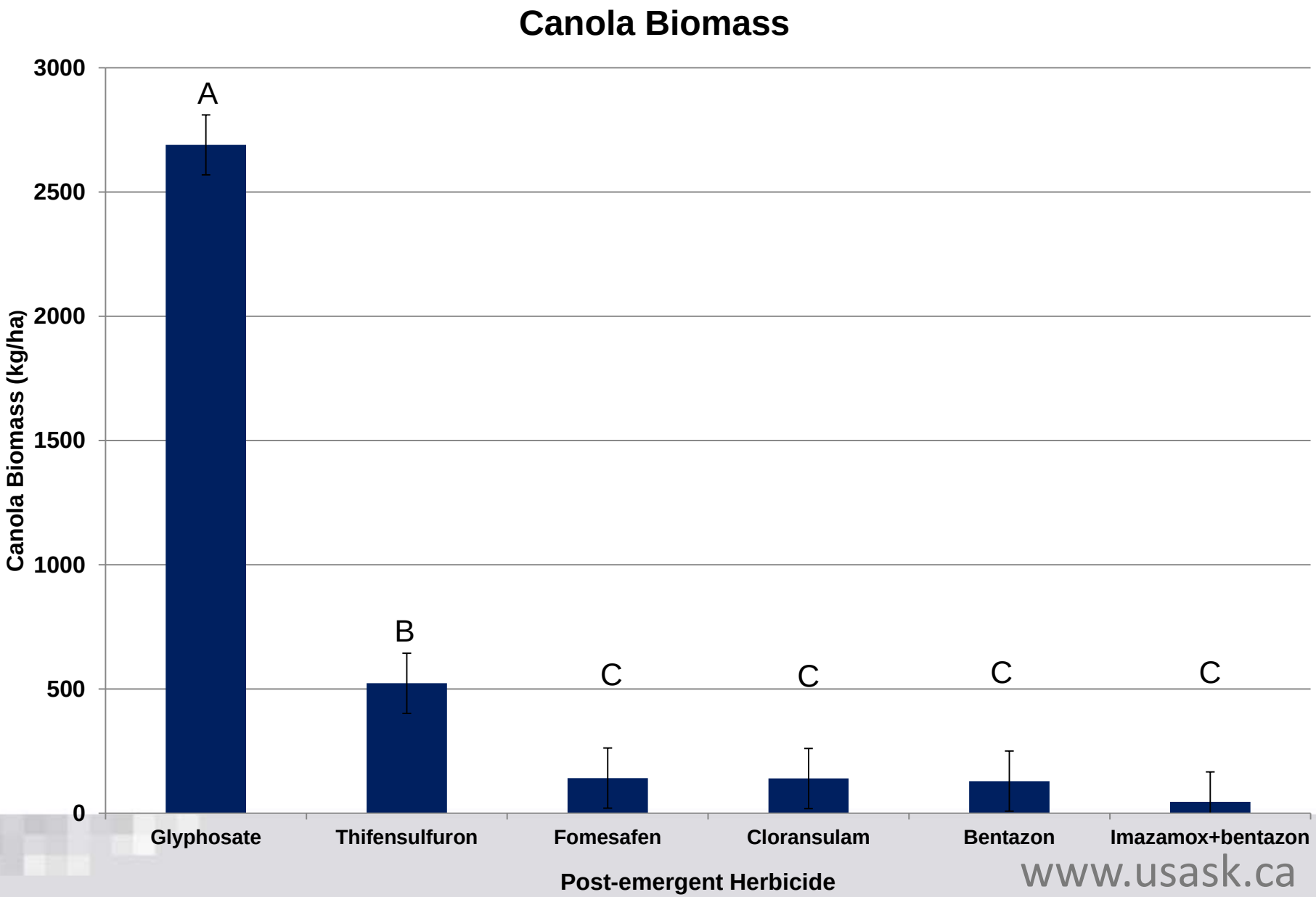
- Heat – pre-seed
- Authority – pre-seed
- Viper – post-emergence
- Heat and Heat / glyphosate - desiccation

Managing RR canola in RR soybean

Pre-emergent Treatments	Application Rate	Post-emergent Treatments	Application Rate
2,4-D LV700 Ester	550 g ai/ha	Basagran	1080 g ai/ha
Express	10 g ai/ha	Reflex	140 g ai/ha
Heat	18 g ai/ha	Odyssey	449 g ai/ha
		Pinnacle (thifensulfuron)	11 g ai/ha
		First Rate (Cloransulam)	21 g ai/ha

*All treatments included 450 g ai/ha glyphosate

*One treatment of pre-emergent glyphosate alone as check


Canola Biomass
3000
2500
2000
1500
1000
500
0
Canola Biomass (kg/ha)
A
B
C
C
C
C
Glyphosate
Thifensulfuron
Fomesafen
Cloransulam
Bentazon
Imazamox+bentazon
Post-emergent Herbicide

ROUNDUP READY 2 XTEND™ SOYBEANS

UNIVERSITY OF SASKATCHEWAN

- Resistant to both glyphosate and dicamba
- Trait not yet available in early maturing cultivars
- Dicamba rate is high 300 to 600 g ai/ha
- Low-volatile formulation
  - **XtendiMax with VaporGrip Technology**

Untreated

560 g ai/ha
Pre-

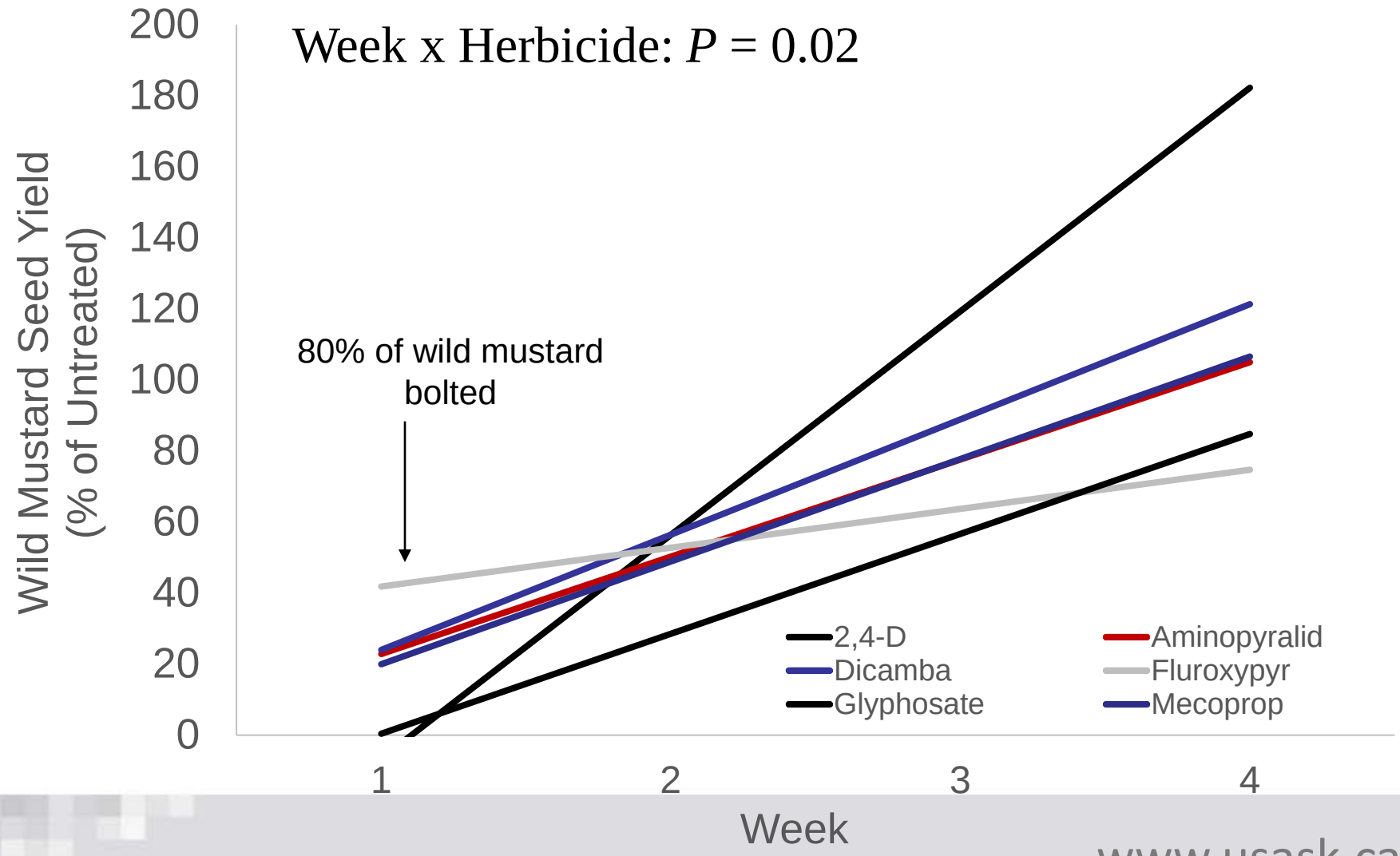
560 g ai/ha
Pre- +
560 g ai/ha Post

Weed Wiping

- Selects for weeds above crop
- Can use non-selective herbicides
- Can target weeds that mature before the crop

Photo: http://www.gaweed.com/slides/prostko-swss-2011/prostko-swss-2011.pdf

Time of Weed Wiping on Wild Mustard Seed Yield



Dicamba - 1st Timing (June 26th)

Photo: E.N. Johnson

Crop-Topping

- Similar to our desiccation; however, the ryegrass stage is the determining factor for application timing;
- Growers will even sacrifice some crop yield to apply herbicide at right timing.
  - Timing: post-flowering to soft-dough
  - Herbicides: diquat, paraquat, diquat / paraquat

1st Year Results – Crop Topping

- Bromoxynil, diquat, fluroxypyr, glufosinate, saflufenacil did not reduce wild mustard seed production in lentil at any stage tested.
- In a different desiccation study, glufosinate has been shown to reduce kochia seed production when desiccating lentils at physiological maturity.

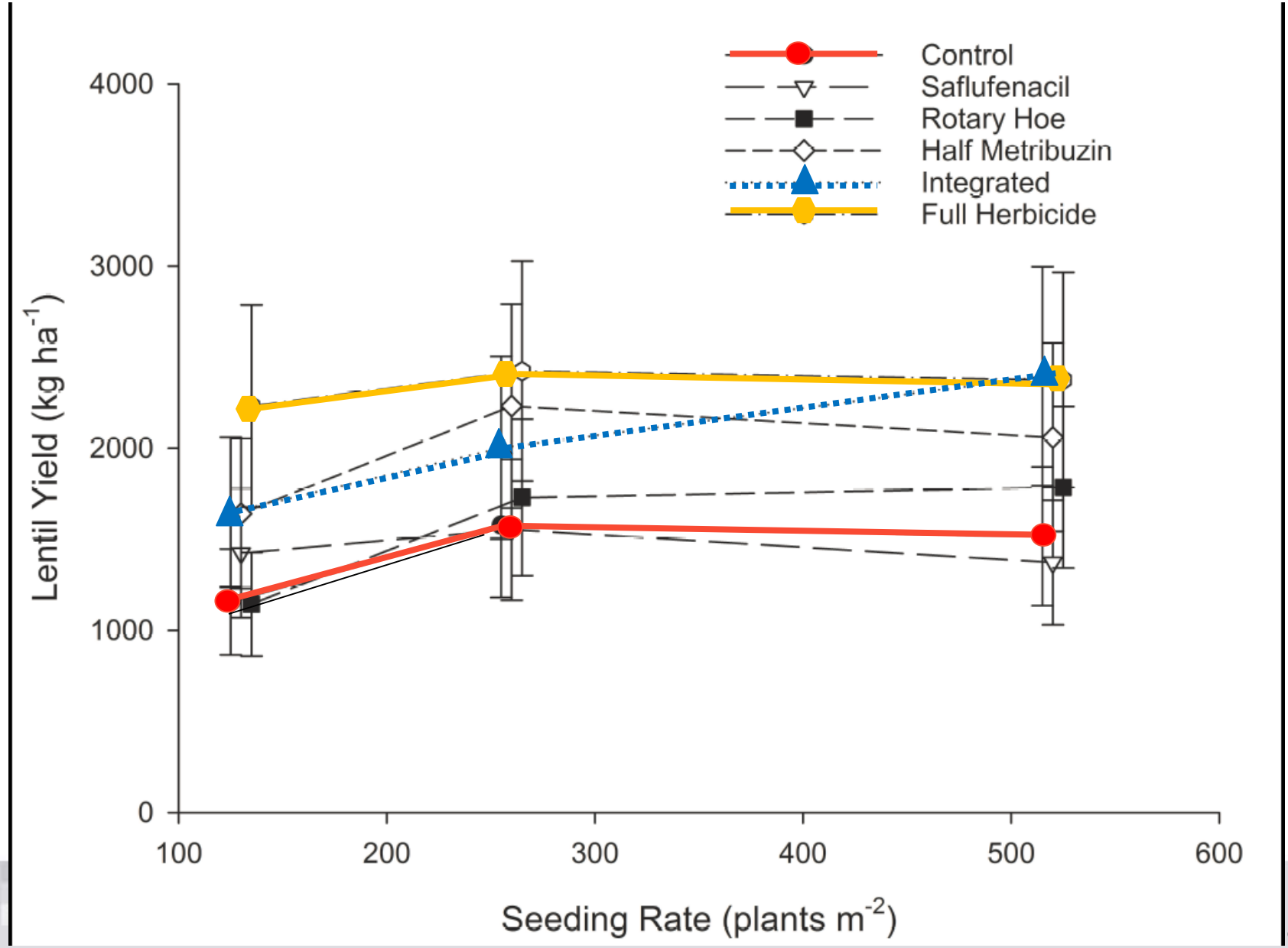
Weed stage-week of 1st application

Photo: H.S.N. Duddu

Integrating Chemical, Cultural, and Mechanical Weed Control for Managing Wild Mustard in Lentil

- Seeding rates – 140, 280, 560
- Integrated – Rotary Hoeing, ½ rate Sencor
- Full Chemical – Heat Pre, Sencor 1X

https://www.youtube.com/watch?v=AqwfX3zF-t8


Control
Saflufenacil
Rotary Hoe
Half Metribuzin
Integrated
Full Herbicide
Lentil Yield (kg ha-1)
4000
3000
2000
1000
0
100
200
300
400
500
600
Seeding Rate (plants m-2)

Site-year(s)	Weed Control	Net Profit ($ ha^{-1})		
		Seeding Rate (plants m^{-2})		
	Treatment	130	260	520
2011 & 2013[a]	Control	517.93	607.18	599.77
	Saflufenacil	637.19	667.55	518.10
	Rotary Hoe	518.43	768.25	740.09
	Half Metribuzin	771.11	1007.96	883.04
	Integrated	781.21	906.02	1011.66
	Full Herbicide	1032.43	1154.47	984.18
2012[b]	Control	934.60	911.81	902.55
	Saflufenacil	893.21	844.41	927.82
	Rotary Hoe	951.77	980.28	750.74
	Half Metribuzin	846.11	926.01	774.71
	Integrated	849.26	930.55	747.77
	Full Herbicide	933.36	729.00	644.36

Conclusion

Acknowledgements

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